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ABSTRACT

Whether information technology (IT) graduates of Illinois colleges exit the state in greater percentages than do other graduates was studied using data from alumni surveys conducted by the public 4-year colleges and universities in Illinois. Data were added from a survey of 575 IT seniors in the 2000-2001 class. Survey data do suggest that IT graduates leave Illinois at a higher rate (in the range of 10 percentage points) than other baccalaureate degree graduates. Employment rates among IT graduates were found to be exceptionally high (over 97%), and the vast majority are employed in IT-related positions (90 to 94%). And despite the higher departure rate (about 40%), most IT alums are employed in Illinois up to 5 years after graduation. Among the IT seniors, 89% indicated the intention of getting a job in Illinois after graduation. The discrepancy between the intention to stay and the numbers who leave may be explained by the high demand for IT personnel throughout the U.S. economy. Another possible answer is that Illinois may lag behind other areas in salaries offered. The implications for instruction and the retention of Illinois IT graduates are discussed. (SLD)

Does Illinois Retain Its IT Majors Upon Baccalaureate Completion? An Analysis of Multiple Survey Results

Final Report

Prepared for :
The Illinois Board of Higher Education

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Center for Governmental Studies
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Executive Summary

The potential mobility created by the robust labor market available to IT college graduates poses a difficult public policy issue for higher education. Should a state's higher education resources be allocated so as to prepare more individuals for IT fields only to witness such individuals take advantage of the abundance of out of state employment opportunities? The answer to this policy issue lies in part in answering the research question of this study: Is Illinois losing its IT college graduates to other states?

The basic question posed for this study is an empirical one. The task is to assess whether IT college graduates exit Illinois in significantly greater percentages than do other graduates. As no administrative reporting system exists to track the locational decisions made by college graduates, this study accessed data from alumni surveys conducted by the public 4-year colleges and universities. We accessed the common question set used by all the institutions and added a survey of IT seniors in the 2000/2001 class of students. Data from industry associations also served to enrich the information base for this study.

The survey data do suggest that IT graduates leave Illinois at a higher rate [in the range of 10 percentage points] than other baccalaureate degree graduates. Employment rates among the IT graduates were found to be exceptionally high [over 97%] and the vast majority are employed in IT-related positions [90-94%]. And, despite the higher departure rate [about 40%], most IT alums are employed in Illinois up to 5 years after graduation [about 60%]. Among the IT seniors, some 89% indicated their intent to get a job in Illinois upon graduation.

The results of the seniors survey versus the alumni surveys yield a degree of incongruence. Intentions to stay in Illinois are high [89%], yet the "yield" rate is substantially lower [60%]. Why? A first answer is that the demand for IT personnel is so strong throughout the U.S. economy that virtually anyone wanting to relocate can find jobs with wage premiums.

Other answers exist in the decision criteria indicated by the IT seniors in selecting a job and the conditions and opportunities in the Illinois economy. The students are keying on salary offers; Illinois seems to be lagging behind in the bidding for IT personnel. The IT seniors are looking for opportunities in IT companies; Illinois and the Midwest are dominated by non-IT companies. That is, the Midwest is dominated by companies that use IT solutions but don't necessarily create such solutions for commercial purposes. The latter are IT companies.

- Several action items/questions emerge from these and other of the study's findings:
- ▶ An economic development agenda could focus on attracting and facilitating the start-up of IT companies.
 - ▶ Are our collegiate programs spawning new IT enterprises? Do the programs encourage creativity and development of new applications, which are the sources for new start up companies and joint ventures with existing enterprises.
 - ▶ The overall IT industry gives strong preference to job experience in hiring. Do our IT programs encourage and accommodate internships, cooperative ed, or give credit for existing work history in IT employment among their students?
 - ▶ Efforts are needed to make the IT students more aware of Illinois IT opportunities.

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Introduction

The revolution in Information Technology [IT] is credited as being a key, if not the driving force, behind the new economy.¹ The use of IT is now common to *all* activity areas including business, education, government, and not-for-profit organizations, and is in extensive use in homes. Over the past 15 years, widespread applications of IT have fueled corporate reorganizations and a wave of capital investments in manufacturing and service firms which have resulted in unprecedented gains in productivity.

As applications of IT have spread throughout the economy so has the demand for individuals skilled in its usage, its installation and service, and in its development and adaptation. The demand for IT personnel has skyrocketed. Virtually every sector in the U.S. economy now reports a surplus demand for IT personnel.² The Information Technology Association of America [ITAA] estimated that in the year 2000 alone some 843,000 IT openings in the for-profit sector would go unfilled.³ Even with the "tech-wreck" stock market tumble of 2000 and 2001, and with the economic slowdown in 2001, demand for IT workers is estimated to exceed supply by some 425,000 in the for-profit sector of companies with more than 50 employees.⁴ Adding the government sector, not-for-profits, and very small companies would witness a significant increase in the unfilled demand for IT personnel.

In response to pressure from a number of industries hard pressed to find IT personnel, the U.S. Congress in 1998 raised the cap on the number of H1-B visas granted so as to allow more individuals with math, engineering, and computer science skills to enter the country. The cap was raised to allow upwards of 50,000 more individuals into the U.S. in each of the fiscal years 1999 and 2000, and an additional 42,500 individuals in fiscal year 2001, assuming the potential immigrants have the requisite IT background. This cap is scheduled to drop back to a total of 65,000 in fiscal year 2002.

The growth of IT occupations clearly has outstripped change in other occupations in the U.S. economy. The tremendous surge in demand began in 1994. In the period of 1994-1998, employment in most occupations in the U.S. grew by 11 percent. In contrast, employment in IT occupations expanded by nearly 28 percent, according to U.S. Bureau of Labor Statistics estimates.

Not surprisingly, this IT growth has not been spread evenly among the various IT occupations. IT-related occupations are summarized in Table 1, which provides a listing developed by the Economics and Statistics Administration [U.S. Department of Commerce]

¹ "The Revolution in Information Technology," Remarks by Federal Reserve Board Chair Alan Greenspan, Boston, Boston College Conference on the New Economy, March 6, 2000.

² The reader is advised from the outset of this report that two major definitions of the industry exist and could not be reconciled for this report in terms of data. Consequently, both definitions and data sets are used. One refers to "high-tech" industries and the other to IT versus non-IT companies.

³ *Bridging the Gap*, Arlington, VA, Information Technology Association of America, April 2000.

⁴ *When Can You Start? Building Better Information Technology skills and Careers*, Arlington, VA, Information Technology Association of America, April 2001.
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Table 1.
IT - Related Occupations

<ul style="list-style-type: none"> ▶ Engineering, science, and computer systems managers ▶ Database administrators ▶ Systems analysts ▶ Broadcast technicians ▶ Computer equipment operators ▶ Data processing equipment repairers ▶ Communications equipment operators ▶ Electrical powerline installers and repairers ▶ Telephone and cable TV installers and repairers ▶ Central office and PBX installers and repairers 	<ul style="list-style-type: none"> ▶ Electrical and electronic engineers ▶ Computer engineers ▶ All other computer scientists ▶ Electrical and electronic technicians ▶ Duplicating, mail and other office machine operators ▶ Billing, posting, and calculating machine operators ▶ Data entry keyers ▶ Electronic repairers, commercial and industrial equipment ▶ Electronic and electronic equipment assemblers, precision ▶ Electro-mechanical equipment assemblers, precision ▶ Electronic semiconductor processors
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Source: U.S. Departments of Commerce and Labor

with the Bureau of Labor Statistics [U.S. Department of Labor].⁵ Within these IT-related occupations, a "core" set is identified as computer scientists, computer engineers, systems analysts and computer programmers. "These are the IT positions that require the most education and skills, are the highest paid, and are greatest in demand."⁶ This set of "core" occupations witnessed an 80% employment increase between 1992 and 1998. This differential demand is evidenced in Figure 1.

Another perspective on IT jobs is provided using the career clusters developed by the Northwest Center for Emerging Technologies [see Figure 2]. This set of career clusters is used by the ITAA in its workforce studies and provides a look inside the "core occupations" reported in the *Digital Economy*.

Although the overall demand for IT personnel has dropped by an estimated 46% since 2000, the unfilled demand for 2001 remains large and is projected to be more than 425,000. This would represent a vacancy rate of 47%. As evidenced in Figure 2, current demand is greatest in the technical support arena, which is the most common position among all firms employing IT personnel. ITAA estimates that about 39% of the gap between IT demand and filled positions is now and in the near-term future for technical support personnel. These positions, found in over 90% of private sector companies of 50 or more employees, focus on the following skill sets: troubleshooting; customer service/facilitation; hardware and software installation, and configuration upgrades; and systems operations, monitoring, and maintenance.⁷

⁵ *Digital Economy 2000*, Washington, D.C., U.S. Department of Commerce, Economics and Statistics Administration, June 2000.

⁶ *Ibid.*, p.46.

⁷ *Bridging the Gap*, op. cit.
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Figure 1.

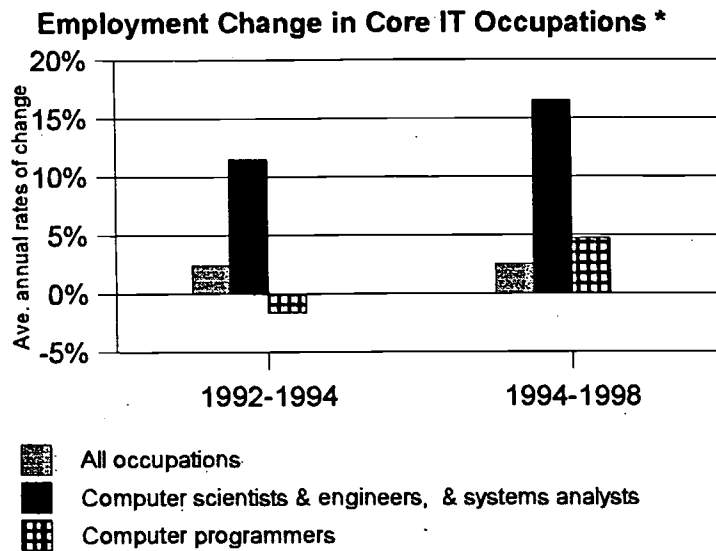
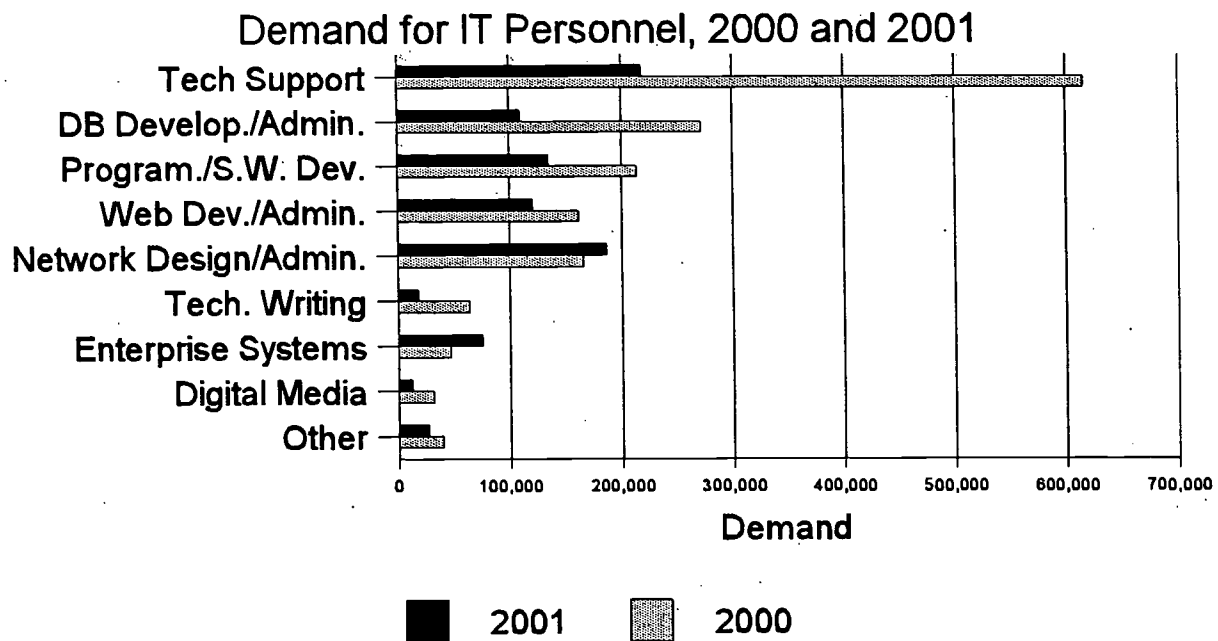


Figure 2.



Also worth noting is that demand *increases* are being realized in two of the career clusters: network design/administration and enterprise systems. Taken in combination with the smallest percentage drop in demand in the web development/administration area, these changes suggest that companies might be working to complete and integrate previously started initiatives more than launching new projects.

ITAA also estimates that 90% of all IT jobs and 70% of the demand for IT workers derives from non-IT companies.⁸ However, based on its survey of some 700 firms, ITAA reports that IT firms have a demand rate that is three times higher than the non-IT sector. That is, the *total demand gap* is greater among non-IT firms simply because there are more of them, but gaging excess demand against total employment reveals that vacancy *rates* are much higher among IT companies.⁹

Just as the demand is not evenly distributed among occupations or types of companies, it also varies by state. The American Electronics Association has compiled data on the presence of high-tech industries among the states.¹⁰ [High-tech is defined to include 45 Standard Industrial Classification (SIC) codes at the 4-digit level. Three major categories largely define this set: high-tech manufacturing, communication services, and software and related computer-related services.] As shown in Table 2, Illinois boasts the 4th largest employment count in high-tech industries among the states and is 5th in the number of high-tech establishments.¹¹

To put these numbers in perspective, we calculated a ratio to measure the state's concentrated share of the national private sector IT employment. These results are also shown in Table 2. The ratio serves as an index of the relative importance of a state's high-tech employment to the industry in the national economy. The higher the ratio value, the greater the importance. As indicated, California's role is highlighted as the 'center' for high-tech employment. Texas is a distant second and Illinois' role is the 8th most concentrated in the nation, based on employment in high-tech industries. A second ratio was calculated based on a combination of high-tech employment and high-tech establishments. Again, a high value on the ratio indicates the relative importance of the state's high-tech presence to the national industry. Again, California's value is calculated as almost 5 times that of Texas, the second ranked state on this indicator. Illinois ranks 4th on this latter indicator. It is worth noting that in the upper Great Lakes and general Midwest area, Illinois and Minnesota stand out as the high-tech leaders.

An additional puzzle piece is found by considering the distribution of IT versus non-IT firms using the ITAA definitions. [IT firms are companies that create and sell IT solutions to customers. Non-IT companies are those that use IT solutions to assist in business operations

⁸ Ibid. IT firms are companies that create and sell IT solutions to customers. Non-IT companies are those that use IT solutions to assist in business operations but are not developing such solutions for commercial sales.

⁹ *When Can You Start?*, op.cit.

¹⁰ *Cyberstates 4.0*, Washington, D.C., American Electronics Association, 2000.

¹¹ Table 2 reports information for a selected group of states to include the consensus "top 10" IT states and a group of other Great Lake and Midwestern states.
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Table 2.
Key Indicators of High-Tech Opportunities

State	H-T Employment, 1998	H-T Establishments, 1998	H-T Employment Concentration, 1998*	Share Ratio Based on Employment	Share Ratio: Employment and Establishments
CA	834,709	28,839	70.18	38.0	314.0
TX	410,955	12,228	56.03	14.7	65.7
NY	328,782	13,368	48.85	10.3	57.7
<u>IL</u>	<u>217,617</u>	<u>9,976</u>	<u>43.46</u>	<u>6.2</u>	<u>28.1</u>
MA	216,654	7,457	79.39	11.4	21.3
FL	209,890	9,027	36.93	5.0	24.5
NJ	184,377	10,234	58.73	7.0	24.6
PA	170,184	6,556	36.31	4.1	14.8
VA	169,653	6,830	63.79	7.0	15.2
CO	145,655	5,531	84.38	8.1	10.5
GA	142,648	6,753	46.07	4.4	12.6
MN	131,127	5,329	60.76	5.3	9.0
MO	74,590	3,548	33.67	1.6	3.4
IN	66,794	2,892	26.90	1.1	2.6
WI	60,531	2,562	26.46	1.0	2.0
KY	34,554	1,645	24.32	0.6	0.7
IA	28,273	1,662	24.27	0.5	0.6
ND	6,425	297	25.91	0.1	0.0

* H-T Workers per 1,000 Private Sector Workers; Illinois ranks 21st on this indicator among the states.
Source: AEA, *Cyberstates 4.0*, 2000; Center for Governmental Studies, NIU.

Table 3a.
Distribution of IT and Non-IT Companies Across Regions

Company Type	Major U.S. Regions*				Total
	Northeast	South	Midwest	West	
IT	25.0	28.5	18.9	27.5	100.0
Non-IT	21.6	32.7	25.7	20.0	100.0

Table 3b.
Distribution of IT and Non-IT Companies Within Regions

Company Type	Major U.S. Regions*			
	Northeast	South	Midwest	West
IT	5.0	3.8	3.2	5.8
Non-IT	95.0	96.2	96.8	94.2
Total	100.0	100.0	100.0	100.0

* Definitions of Regions:

Northeast: ME, VT, NH, MA, CT, RI, NY, NJ, PA, DE, MD, DC

South: VA, WV, KY, NC, SC, TN, GA, FL, AL, MS, AR, LA, OK, TX

Midwest: ND, SD, NE, KS, MO, IA, IL, MN, WI, IN, MI, OH

West: WA, OR, ID, MT, WY, CO, NM, AZ, UT, NV, CA, HI, AL

Source: ITAA, *When Can You Start?*, April 2001

but are not developing such solutions for commercial sales.] ITAA estimated the distribution of such firms by four major regions in the U.S., the results of which are in Table 3. As indicated, IT companies are the least prevalent in the Midwest, whether viewed from the distribution of IT firms nationwide or the distribution of companies within the region between IT versus non-IT operations.

From this brief sketch of the IT marketplace, we find:

1. a market in which employment has dramatically increased since 1994,
2. a very aggressive sellers' marketplace in which demand for high-tech workers remains very

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unsatiated,¹²

3. the Midwest with the strongest demand and largest number of projected vacancies [estimated at 35% of national demand and vacancies] in IT positions among the major regions in the U.S.,
4. the Midwest with the lowest incidence of IT companies among the major U.S. regions despite being a center for high-tech industries,
5. Illinois as the 4th largest employment center for high-tech work,
6. Illinois as the 5th largest center for high-tech as measured by the number of high-tech establishments, and
7. Illinois as the lead high-tech state in the Midwest.

Finally, we note that in any sellers' market, individuals are positioned to benefit from a seemingly insatiable demand, wherever that demand might exist. In Information Technology, the demand is ubiquitous; it exists virtually everywhere in the U.S. with over 90% of all firms reporting the use of IT personnel. But, like other fields, IT has its geographic concentrations, as noted above. As a result, in the bidding to attract employees, we can expect to see a market that is characteristically more mobile than other fields. People entering the IT arena can be confronted with job opportunities distributed nationwide and mobility will be directed toward IT centers that pay wage premiums. In addition, one can expect that economies of agglomeration make such IT centers particularly attractive locations for both firms and workers.¹³

Purpose of This Study

This potential mobility poses a difficult public policy issue, especially for higher education. Most preparation for an IT field occurs in higher education and a baccalaureate degree is considered the most effective pre-hire training by HR personnel hiring individuals for IT positions.¹⁴ The difficult policy question, then, is whether a state's higher education resources should be allocated so as to prepare more individuals for IT fields only to witness such individuals take advantage of an abundance of out of state employment opportunities.

The first part of this policy question was addressed in Illinois in study form and by resolution of the Illinois Board of Higher Education [IBHE] in 1998, 1999, and 2000.¹⁵ In its July 1998 report, the IBHE recommended that public universities and community colleges

¹² It is worth noting that in 2001, the sellers' market has yielded to more of a buyers' market, despite excess demand. Companies have become more cautious in hiring and the 'buying' frenzy of 2000 has abated considerably.

¹³ An agglomeration economy is one where cost savings and other advantages accrue because of being located in close proximity to a cluster of firms that hire the same types of workers, use the same types of raw materials, have needs for similar types of business services, and use the same types of transportation modes for shipping and receiving raw materials and finished products.

¹⁴ *Bridging the Gap*, op.cit.

¹⁵ *Workforce Preparation Issues in Information Technology*, Illinois Board of Higher Education, July 1998; *Statewide Analysis for Public University Program Review*, Illinois Board of Higher Education, August 1999; and *Status Report on Information Technology Workers: 2000*, Illinois Board of Higher Education, October 2000.

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review their curricula and programs, and update them to respond to changing IT needs of businesses and society. In 2000, the IBHE adopted a resolution requesting proposals for program improvements for the FY2000 budget:

“Public universities and community colleges should review curricula and programs and update them to be responsive to changing information technology needs of businesses and society. Public universities and community colleges should also collaborate with industry to match the capacity of programs to current and future demand. Specific proposals for program improvements may be submitted to the Illinois Board of Higher Education in the budget development process. The Board will give priority to expansion of current programs and development of cooperative programs.”

The July 1999 IBHE report also noted that the Governor's FY2000 budget contained a \$3.15 million IT worker shortage initiative of which \$1.35 million was specifically earmarked for increases for computer science program improvements at public universities and \$1.00 million to DePaul University. The report also acknowledged the need for a continued commitment of resources dedicated to addressing the IT worker shortage.

The IBHE has provided leadership in encouraging and facilitating collaboration among public universities, community colleges, and industry to better match the capacity of academic programs to the current and future demand for IT workers. The Board's efforts have included formal dialogues between educators and industry leaders, as well as funding research to provide better information about the parameters of the IT labor market and worker shortage. In addition, the Board has made several challenges to public university IT programs related to expanding the number of baccalaureate computer and information science graduates. In particular, the Board challenged programs *to expand recruitment, retention, and completion at each level to double the number of baccalaureate computer and information science graduates by 2006*. It further called on the programs to simultaneously continue *providing the graduate level programs necessary to prepare the faculty needed to increase enrollment at the baccalaureate level*.¹⁶

It should be noted that as part of its program review of August 1999, the IBHE prepared a report on the status of the IT programs in the state. Among its findings were the following:

- ▶ Between 1994 and 1999, 21 new baccalaureate degrees in information technology had been added across Illinois; and
- ▶ The 26 IT master's degree programs available in Illinois in 1999 were 14 more than were available in 1995.

A status report on IT workers was presented at the October 2000 IBHE meeting. The report provided some of the conclusions and directions recommended from the above mentioned IT dialogues. These included the following:

- ▶ Partnerships are key in developing responses to the needs in IT;
- ▶ The capacity issue involves increasing the number of IT faculty as well as the number of IT

¹⁶ IBHE, 1999, p.42.

students;

- ▶ There is a need for a P-16 educational initiative and a commitment to increasing the participation of women and minorities in the IT labor market;
- ▶ The rapid growth of e-commerce is requiring the hiring of IT workers at an exponential rate;
- ▶ The IBHE should continue to place high priority on supporting existing IT programs and approving additional programs in IT fields; and
- ▶ The IBHE should increase incentives and student financial aid to students preparing for careers in IT fields in Illinois.

The report also noted that while great progress was being made in increasing enrollment and degrees awarded in IT related programs across the state, the demand for IT workers continued unabated. Progress in closing this demand/supply gap was becoming and remains an urgent and pressing need.

In 2000-2001, the IBHE has continued its information gathering efforts related to the IT worker shortage in Illinois. This study is part of that effort. It focuses on a question posed to the IBHE by the Illinois General Assembly regarding the retention of IT graduates to the Illinois economy. That is, *is Illinois losing its IT college graduates to other states?*

Study Procedures

The basic question posed for this study is an empirical one. The task is to assess whether IT college graduates exit Illinois in significantly greater percentages than do other graduates. A broader question exists as well, namely whether overall Illinois is experiencing a "brain drain" in the IT fields. That is, is Illinois gaining or losing on net in the battle for IT personnel?

This study endeavors to answer the first of these two questions while speculating about the broader issue.¹⁷ No administrative reporting system exists to track the locational decisions made by college graduates. However, the IBHE and the public 4-year colleges and universities engage in an annual alumni survey program whereby a common set of questions is asked by each institution of its graduates. Of special interest among the common questions is the zip code of each respondent's primary employer.

The annual survey alternates each year between a survey of baccalaureate graduates from one year ago and a survey of alumni who graduated five years ago. This study uses the survey of graduates conducted in fiscal year 1998 [July 1, 1997 to June 30, 1998] of graduates of the class of 1997 and the survey conducted in fiscal year 1999 [July 1, 1998 to June 30, 1999] of alumni who graduated in class of 1994. The surveys are conducted by the various state supported schools and the aggregate results on the core or common questions are reported to the IBHE.

¹⁷ The IBHE noted the importance of answering the broader question in its October 2000 IT report. In particular, it stated the need to fund a study of migration into Illinois by IT workers in an effort to address the "net" migration issue. The current study will address *only* the outflow of recent IT baccalaureate graduates.

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The data reported to the IBHE aggregates each respondent's degree major according to sixteen Classification of Instructional Programs codes [CIP] used in a protocol set forth by the IBHE. For the purposes of analyzing the question posed for this study, these aggregate CIP codes were found to be inadequate, as the IT majors of interest were co-mingled with many other majors. Each of the public universities in the state was contacted by letter in an effort to secure the raw data for majors of interest for the two mentioned survey years. We used the IBHE's definition of IT, which includes the following degree majors:¹⁸

<u>Major Degree Field</u>	<u>CIP Code</u>
▶ Computer and information science	11.
▶ Computer engineering	14.0901
▶ Electrical and electronics engineering	14.10
▶ Electrical engineering related technology	15.03
▶ Math and computer science	30.08
▶ Business information systems	52.12

The appropriate raw data files were received for the following institutions:

- ▶ Eastern Illinois University
- ▶ Northeastern Illinois University
- ▶ Northern Illinois University
- ▶ Southern Illinois University - Carbondale
- ▶ Southern Illinois University - Edwardsville
- ▶ University of Illinois - Chicago
- ▶ University of Illinois - Urbana/Champaign
- ▶ Western Illinois University

Illinois State University sent useful summary data for the majors of interest.

According to information about annual degrees awarded in the each of the designated IT majors, the institutions from which we received raw data account for more than 90% of the IT degrees granted by Illinois publicly supported universities.

The alumni survey data does enable an estimate of the percentage of graduates who are employed in Illinois in the first year and after five years following graduation. Counting only those responses with reported zip codes of employment, 76.3% of the *employed non-IT* baccalaureate graduates from Illinois public universities in the 1997 class were employed in Illinois. In contrast, only 64.3% of the IT graduates from the same class were employed in Illinois.

¹⁸ We did not include CIP 52.0407, Information Processing/Data Entry, or CIP 15.04, Electro-mechanical and Maintenance Technician, as there was no baccalaureate enrollment at any of the public institutions in Illinois as of Fall 1998, according to the data provided to this study. The IBHE definition of IT "included only programs where there is a direct, primary relationship to IT, rather than a peripheral one; i.e., where the program directly impacts technology hardware and software rather than where a program includes only the utilization of IT products and services." [IBHE, 2000, p.41].
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Similar results were calculated from the survey of the class of 1994 baccalaureate graduates, based upon the nearly 60% of respondents who listed the zip code of their primary employer. Of the *non-IT majors*, 72.3% were employed in Illinois five years after their baccalaureate completion. Only 61.1% of the 1994 class of IT graduates reported working in Illinois. *These differential rates suggest that the question of a potential drain of IT talent from the state warrants further investigation.*

A third source of data was collected to enable further inquiry. The alumni survey data do not allow us to inquire about reasons for job selection or whether Illinois was a preferred place for employment. To address these latter concerns, we contacted department chairs of the IT majors in the various universities in the state and asked them to assist us in surveying IT seniors slated to graduate between October 1, 2000 and June 30, 2001.¹⁹ We ultimately were able to secure survey responses from 315 seniors in 8 departments at 7 universities [5 public and 2 private]. These responses represent between 10% and 15% of the anticipated number of IT degrees to be awarded by June 30, 2001.

Two additional data sources were accessed for this study. A survey of high school seniors in 1999 was conducted for the IBHE by ACT, Inc., and is used to gage the percentage of college bound students opting to stay in Illinois or go out of state to college. The results of this study indicated that approximately 75% of the respondents reported staying in state to go to college immediately following high school graduation.

We also inquired of the Illinois Community College Board [ICCB] regarding their follow up surveys of community college graduates. We received very useful summary data from the ICCB regarding the community college system's IT graduates. Each academic program in the state is the subject of the followup survey on a rotating basis (each program's graduates from the previous academic year are surveyed once every six years or so). Results for the IT majors identified by the ICCB are based on the 1996 survey of academic year 1995 graduates. Most graduates are surveyed six to nine months following their graduation. About 90% of the respondents who were employed reported being employed in Illinois.

Baccalaureate Follow up Surveys of IT Graduates

We have pointed out above that there is a differential between the percentage of IT versus non-IT graduates who are found employed in Illinois. In this section, we will elaborate on the responses of the IT graduates to the questions asked in the alumni surveys and begin the analyses of the observed differentials in place of employment.

Class of 1997

There were 575 respondents from the class of 1997 who graduated with a major in an IT field from a public institution. This represents a response rate among the IT graduates of 37.9%. Of the respondents, 73 % were male and 27 % were female. In terms of race, 69.6%

¹⁹ A copy of the survey instrument is attached in an appendix.
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are 'black/non-Hispanic'.

The respondents are distributed in general consistency with the distribution of IT degrees awarded by institution of the awards [see Figure 2].²⁰ The SIU and UI systems are fairly well represented overall. Within the UI system, the Urbana campus is over-represented in the responses while the Chicago campus is slightly under-represented.

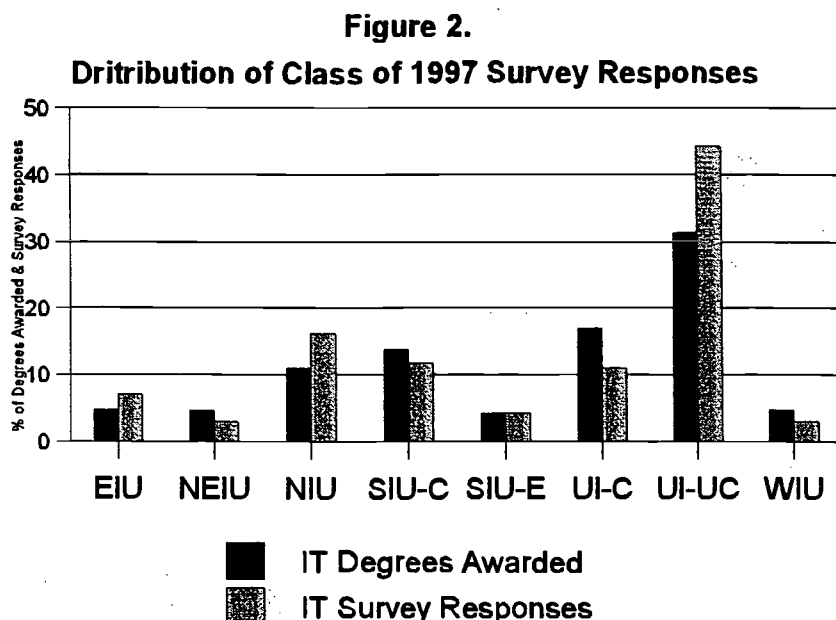
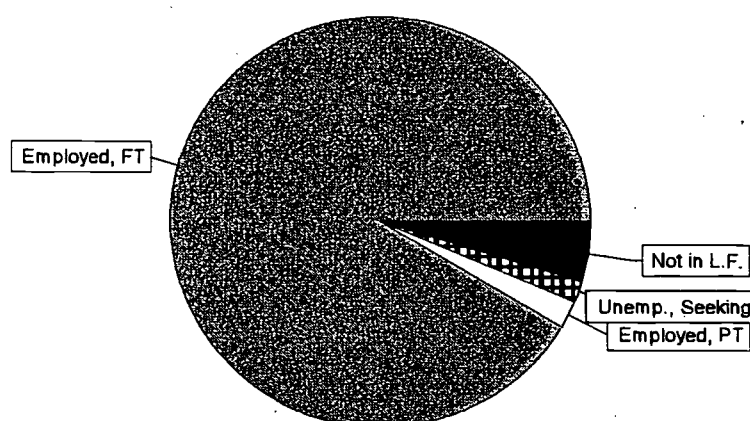


Figure 3.
Employment Status of Class of 1997 IT Graduates



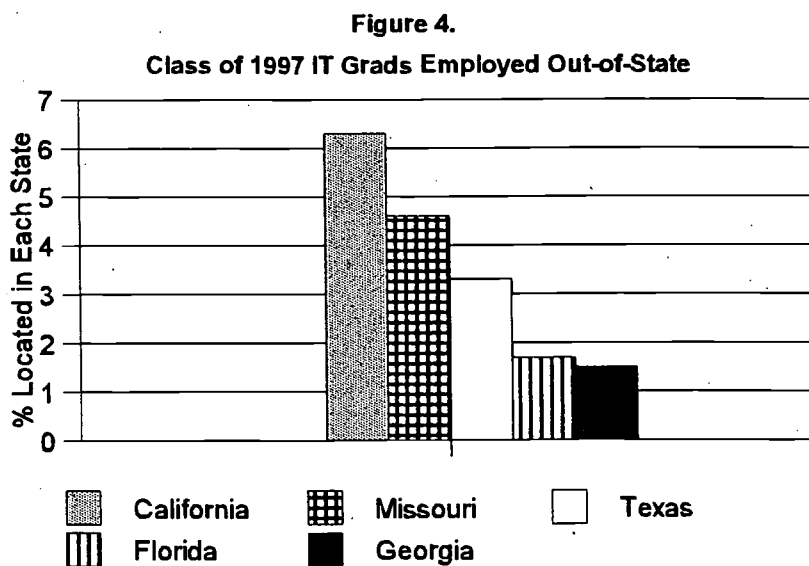
²⁰ The 575 total does not include the responses from graduates of Illinois State University. Center for Governmental Studies, Northern Illinois University

The class of 1997 IT graduates reports being employed [see Figure 3]. Over 91% of the respondents reported being employed full-time and another 2.3% were employed part-time. Only 1.4% reported that they were unemployed and seeking work.

Nearly 94% of the employed IT respondents reported working at a job that was related or closely related to their major. Less than 1% reported that they were working in an unrelated job, but not by choice. About 27% of the respondents had taken classes after graduation. Of those, over half reported working on an academic master's degree and another 10-15% reported working on a professional master's degree.

About 11% of employed IT respondents reported that their first job after graduation was a job they held *while they were enrolled*. Another 65.4% indicated that they had secured their first job by the time they graduated, and another 4.7% had secured their first job by one month after their graduation. Only about 2% of the employed graduates required nine months or more to secure their first post-graduation.

As to where the employed IT respondents of the class of 1997 held jobs, some 32 states plus the District of Columbia, Guam, and two APO's were mentioned as the zip code of their primary place of employment. As reported earlier, *at least 59.9% of the IT respondents who are employed list a zip code in Illinois as their primary place of employment*. On the other hand at least 38% of the IT respondents report their place of employment as not in Illinois [see Figure 4].



Three points are noteworthy from the 1997 alumni survey responses:

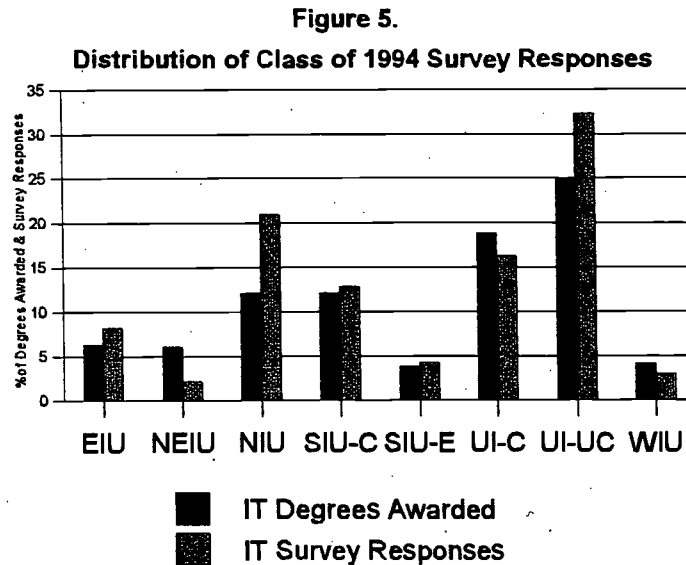
- ▶ Nearly 97% of the employed respondents were working in an IT-related job;
- ▶ Over 80% of the employed IT respondents had secured their jobs within one month after graduation; and
- ▶ Nearly 2/5 of the employed IT respondents were employed outside of Illinois.

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Class of 1994

A total of 368 public institution IT graduates from the class of 1994 responded to the alumni survey conducted in 1998, representing a response rate of 24.8%.²¹ Men represented 68.9% of the responses, women 30.6%. In terms of race, 77.7% were 'white/non-Hispanic', 11.4% were 'Asian/Pacific Islander', and 3.4% were 'black/non-Hispanic'.

As with the 1997 survey, the responses fairly well reflect the distribution of degrees awarded by public institution [See Figure 5]. IT graduates from the UI system represented



48.6% of the respondents as compared to 43.6% of the degrees awarded. As with the survey of 1997 graduates, UI-UC is over-represented in the class of 1994 responses. NIU also is over-represented with nearly 21% of the respondents earning their degrees from NIU compared to only 12.1% of the degrees awarded from NIU.

About 96% of the respondents reported being employed full time; another 1.4% were employed part time. Fewer than 2% reported themselves as unemployed and not seeking work.²²

About 90% of the employed respondents reported working at a job that was related or closely related to their major. Fewer than 1% reported that they were working in an unrelated job not by choice. Nearly 22% of the respondents had earned another degree since their bachelor's degree. Nearly two-thirds (63.8%) of those respondents reported earning an

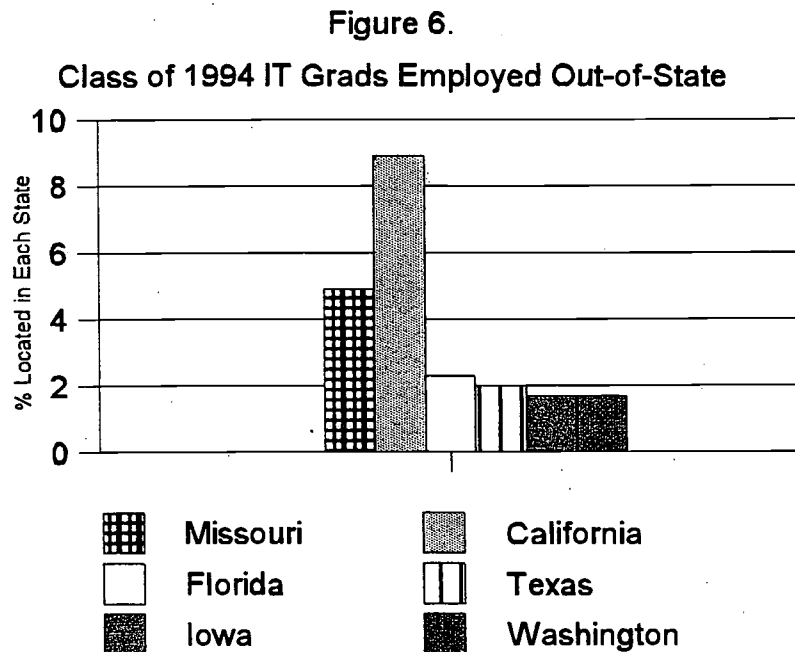
²¹ The 368 total does not include the responses from graduates of Illinois State University.

²² This low percentage essentially not in the workforce probably reflects a selective bias among the respondents. That is, alumni who were employed were more likely to respond to the survey. However, such a bias will benefit this study as we want to know where the class of 1994 is employed. Center for Governmental Studies, Northern Illinois University

academic master's degree, while another 22.5% earned a professional master's degree. About 16% of respondents reported being currently enrolled in a degree program either full or part time. About half of those respondents who are currently enrolled are working toward a professional master's degree, while another 31% are working on an academic master's degree.

Of those respondents answering the question, about 37% reported having had only one employer since graduation, and another 37% had experienced two employers. Less than 1% reported having worked for six or more employers since graduation.

At least 59.7% of those respondents who were employed list a zip code in Illinois as their primary place of employment. In all, 26 states plus the District of Columbia and one APO were mentioned by respondents as their primary place of employment. The major states employing IT graduates from the class of 1994 are shown in Figure 6. In total, almost 39% of the 1994 IT



responding graduates report being employed in a state other than Illinois. This is essentially the same percentage of graduates from the 1997 class of IT graduates who reported their place of employment as not in Illinois.

Three summary points are noted about the 1994 IT alumni responses:

- ▶ 90% of the employed IT respondents were working in an IT-related job;
- ▶ 73% of the IT respondents had changed employers at least once; and
- ▶ Nearly 2/5 of the employed IT respondents were employed outside of Illinois.

Survey of the Class of 2001

In an effort to better understand the information from the baccalaureate followup surveys, a survey was conducted of current seniors enrolled in IT majors at institutions in Illinois. Responses were received from 315 seniors at eight different departments at seven different institutions. It should be noted that participants in the survey included departments at:

- ▶ Governors State University,
- ▶ Illinois State University,
- ▶ Northern Illinois University,
- ▶ University of Illinois-Chicago,
- ▶ University of Illinois-Springfield,
- ▶ Augustana College, and
- ▶ Illinois Institute of Technology.²³

Of the eight departments returning surveys,

- ▶ one was an electrical/computer engineering department (3 student responses),
- ▶ two were management information systems or operations management information systems departments (68 responses),
- ▶ two were computer science departments (125 responses),
- ▶ one was an applied computer science department (73 responses), and
- ▶ two were mathematics and computer science departments (46 responses).

Thus, the responses to the senior survey are dominated by computer science majors of one type or another.

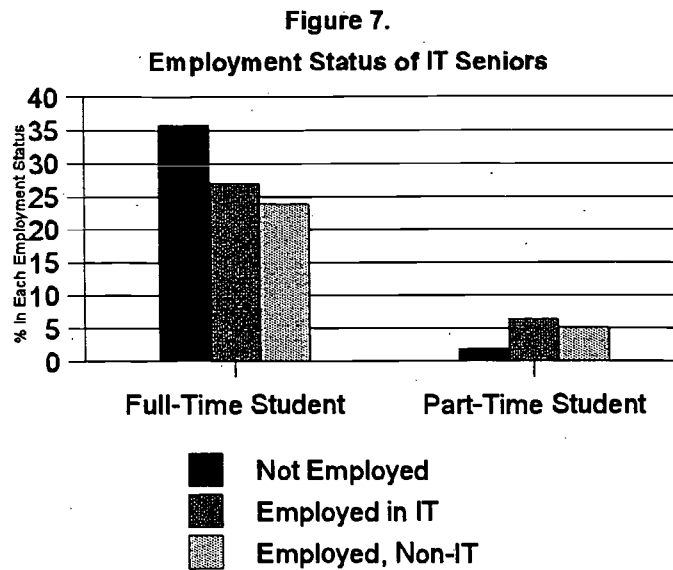
The survey of current seniors sought several different types of information, including:

- ▶ place of residence at time of college application,
- ▶ current place of permanent residence,
- ▶ preferences for location of first post-graduation job,
- ▶ factors in selection of first job, and
- ▶ knowledge of IT labor market.

Of the 315 respondents, 223 [71%] were male; 29% were female. About 69% of the respondents were 'white/non-Hispanics', about 17% were 'Asian/Pacific Islanders', and 4.6% were 'black/non-Hispanic'. More than 62% of the responding seniors report being employed [see Figure 7]. Some 51% report being employed full-time. Of interest is that nearly one-third of the seniors already hold an IT job, whether full or part-time.

About 93% of the respondents reported being residents of Illinois when they applied to their current college or university. Just over 90% of the seniors indicated that their current permanent home is in Illinois.

²³ Thus, between the alumni and senior surveys, every state supported university's IT majors are represented in the data except for Chicago State University.
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When asked about their post-graduation plans, about 90%²⁴ of the responding seniors indicated that they intended to work in an IT job and an additional 6% indicated that they intended to go to graduate school. Nearly all of the students intending to go to graduate school planned to attend a school in Illinois.

Nearly 89% of the responding IT seniors say that they *intend* to get a job in Illinois after graduation [see Figure 8]. Of those who reported intending to get a job in another state, over 36% indicate that they intend to work in California.

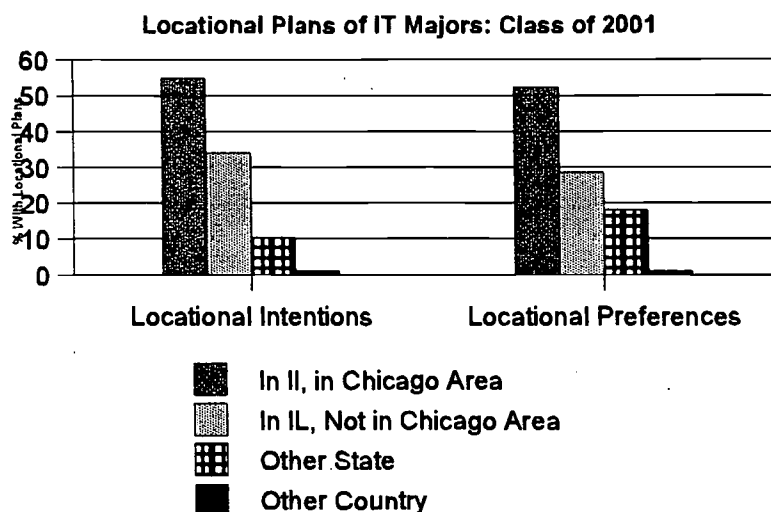
Almost 81% of the seniors reported that they *preferred* to get a job in Illinois, but slightly more than 18% report a preference for another state. This latter is 8 percentage points greater than intentions suggesting a proclivity to be open to opportunities outside of Illinois. Among those preferring another state, nearly half [47%] wanted to get a job in California. Preferences for other states were very evenly divided among 13 other states.

If preferences and intentions are so high for staying in Illinois [between 81% and 88%], assuming that the senior respondents adequately represent all IT graduating seniors in the state, then why is the "yield" rate substantially lower [around 61% based on the two alumni surveys]? To begin to address this question, the senior IT survey asked respondents to indicate up to their three "most important" criteria for choosing the location of their first job after college. up to their three "most important" criteria for choosing the location of their first job after college. Criteria mentioned most often (in order of frequency of mention) were:

- ▶ best salary offer (75.9%)

²⁴The 90% figure includes verbatim responses in the "other" category which indicated that the respondent intended to work in IT following graduation.
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Figure 8.



- ▶ best benefit package (47.0%)
- ▶ proximity to family (47.0%)
- ▶ proximity to significant other (21.9%)
- ▶ cost of living (21.0%)

Next, we asked the respondents a set of questions to assess their knowledge of the IT marketplace. In particular, we wanted to evaluate their perceptions regarding IT employment in Illinois. Respondents were asked to identify the top five states in terms of their total employment in IT/high-tech fields. The seniors were asked to rank states from highest IT employment to lowest, using only the states in the following list:

- ▶ California,
- ▶ Connecticut,
- ▶ Illinois,
- ▶ Massachusetts,
- ▶ New Jersey,
- ▶ New York,
- ▶ Texas,
- ▶ Virginia, and
- ▶ Washington.

About 60% of the students ranked Illinois in the top three in high-tech employment, with Illinois ranked first by 12.1%. According to the American Electronics Association (2000), Illinois ranks fourth nationally in high-tech employment (1998 employment figures). Their figures indicate that Illinois only trails California, Texas, and New York in high-tech employment (see Table 2, above). Other observations include:

- ▶ Nearly 76% of the student respondents ranked California first in high-tech employment,

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- ▶ Almost 43% ranked New York first or second (only about 13% ranked New York outside the top five), and
- ▶ About 26% ranked Texas in the top three (about 57% ranked Texas somewhere in the top four, but 37% did not rank Texas in the top five).

Those who ranked Illinois higher on the dimension of high-tech employment were more likely to prefer to get a job in Illinois after graduation.

We also asked the seniors to rank the states on the basis of IT/high-tech wages from highest to lowest using the same list of states. We found that:

- ▶ About 56% of the students ranked Illinois in the top three, but only about 22% thought Illinois was in the top two states.
- ▶ Only about 15% of the student respondents failed to rank Illinois in the top five in wages.

In reality, Illinois is not in the top five in high-tech wages. Indeed, the American Electronics Association (2000) report ranks Illinois 15th in high tech wages. However, students do not appear to recognize this based on their answers to the survey question. Nevertheless, wages were the single most important factor in selecting a job according to the student respondents and may be a factor in drawing IT graduates from Illinois once the students begin to receive firm offers for their services in 2001. This may also account for the gap between the proportion of college seniors indicating a desire to stay in Illinois to work and the proportion who apparently do so based on the results of the baccalaureate follow-up surveys. *Those students who did not rank Illinois in the top five in wages were much more likely to prefer to get a job in another state or country after graduation* (about 40% versus an average of about 13% for those students who ranked Illinois in the top three in wages).

Of interest is how the IT seniors differed in their most and least mentioned job selection criteria. The Figure 9 series below and the summary in Table 4 compare and contrast these criteria based on where the seniors prefer to get their first job after graduation.²⁵

²⁵ Due to the very small number of responses, military assignment was not considered in ranking the criteria (only three seniors checked military assignment as an important criterion).
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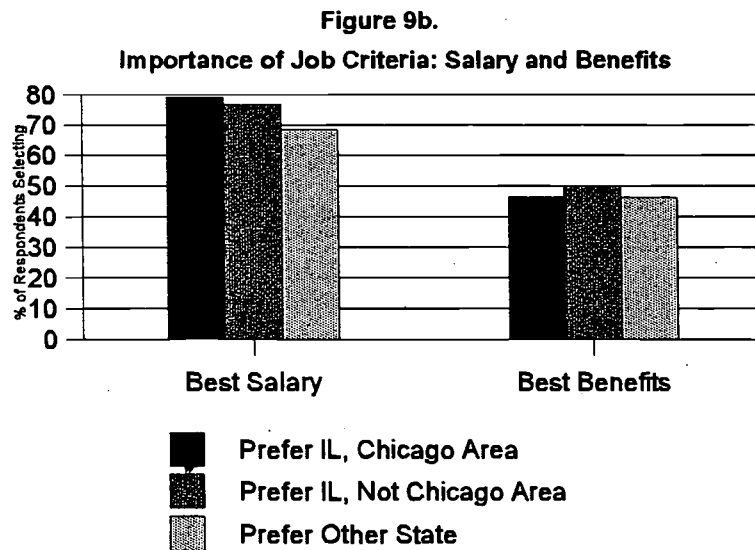
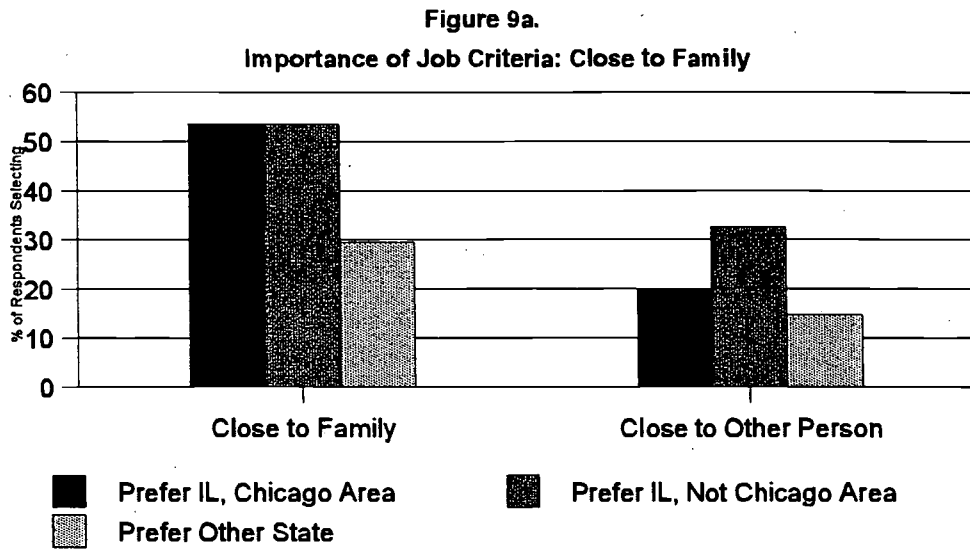


Figure 9c.

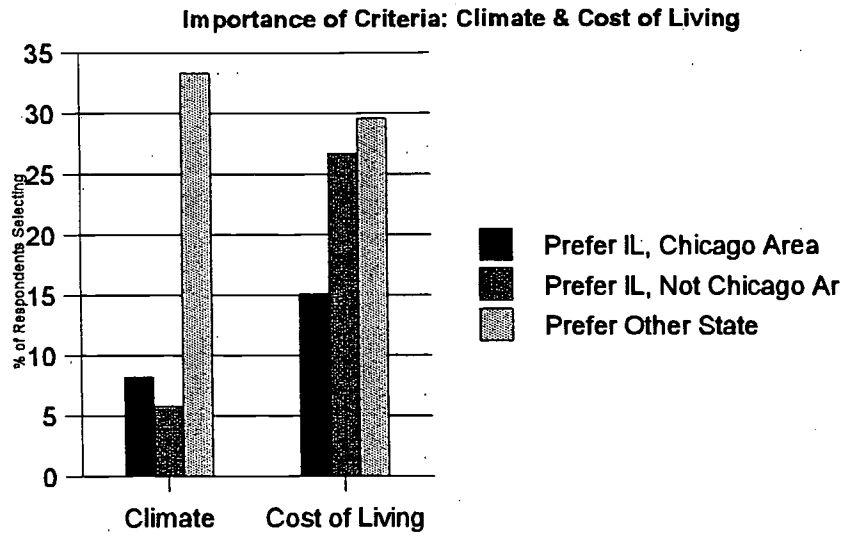
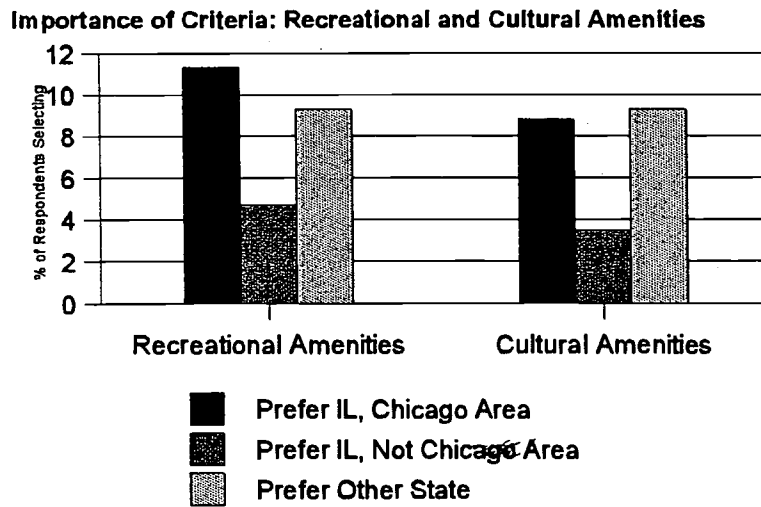


Figure 9d.



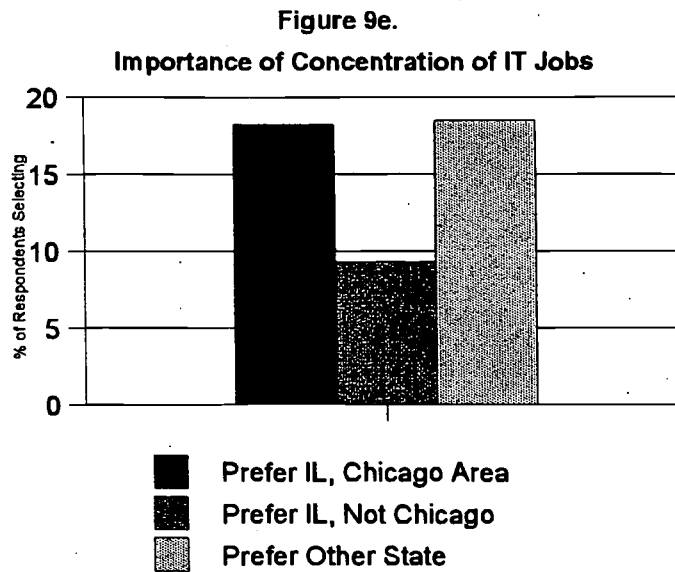


Table 4.
Most and Least Important Criteria
for Job Selection Among IT Seniors

Prefer a Job In:	Most Important Criteria:		Least Important Criteria:	
Chicago Area	Best Salary Offer	79.2%	Climate	8.2%
	Proximity to Family	53.5	Cultural Amenities	8.8
	Best Benefits	46.5	Recreational Amenities	11.3
IL, but not Chicago Area	Best Salary Offer	76.7%	Cultural Amenities	3.5%
	Proximity to Family	53.5	Recreational Amenities	4.7
	Best Benefits	50.0	Climate	5.8
Outside of IL	Best Salary Offer	68.5%	Recreational Amenities	9.3%
	Best Benefits	46.3	Cultural Amenities	9.3
	Climate	33.3	Proximity to Significant Other	14.8

All students, regardless of locational preference, mention best salary offer most frequently. The second most mentioned criterion differs by locational preference. Those seniors preferring to stay in Illinois mention proximity to family. In contrast, of those preferring to leave Illinois, the best benefits package was mentioned with the second highest frequency. With the third most mentioned criterion, approximately half of all those seniors preferring to stay in Illinois mentioned the best benefits package. For those preferring to leave Illinois, the third most frequently mentioned criterion was indicated by only a third of the students, namely climate.

Regardless of where the seniors preferred to start their IT career, proximity to cultural and recreational amenities appear to be unimportant as decision or job selection criteria.

IT seniors overwhelmingly indicated that working in either the software services or the data processing and information services fields most interested them, among the various high tech industries [see Table 5]. Nearly 75% of the IT seniors indicated one of these two industries as the industry that most interested them for the first job after graduation. Nearly 50% were most interested in software services. Seniors preferring to find a job in the Chicago area were the

Table 5.
Tech-Tech Industry of Interest to IT Seniors

High-Tech Industry*	% Indicating Interest
Manufacturing:	
Computers & Office Equipment	3.0
Consumer Electronics	1.7
Communications Equipment	3.7
Electronic Components & Accessories	1.0
Semiconductors	<1.0
Industrial Electronics	<1.0
Photonics	<1.0
Defense Electronics	<1.0
Electro-medical Equipment	<1.0
Communications Services	7.1
Software Services	47.3
Data Processing & Information Services	26.4
Rental, Maintenance, & Other Computer-Related Services	1.0
* List taken from American Electronics Association	

most interested in these two fields [75.3%] while those preferring to find a job out-of-state showed less interest in these two fields [66.1%]. Illinois ranks 10th and 11th nationally in employment in data processing/information services and software services, respectively. This

indicates an under-representation of employment in these industries in Illinois when compared to other IT states.

What Does All of This Mean?

First, we must begin with a caveat. There likely is a bias in the alumni surveys favoring those who are employed. That is, alumni who are employed and therefore can respond quite positively to a survey from their alma mater are more likely to take the time to respond than those having less success. But, for this study, such a bias works in favor of the research as it is about those succeeding in the IT marketplace that we want to learn. We cannot, however, in any way assume that the responses are random. Given this comment, *we do observe evidence of baccalaureate graduates of IT fields leaving Illinois at a higher rate than graduates from other fields and disciplines.*²⁶

Second, although the IT marketplace has taken its licks in the stock market and a degree of shake-out among companies has been witnessed in 2001, IT remains an aggressively strong field. It is very unlikely to wane for long. Even now, non-IT companies continue to outsource for IT support, many to programming and software enterprises in India, Ireland, and elsewhere. And, the demand for IT personnel continues to far exceed the available supply of qualified candidates. Thus, we encourage the IBHE to continue its efforts to increase the number of IT graduates. It may be as or more important to promote the full integration of IT applications into college curricula, regardless of major.

Third, if IT graduates are leaving at higher rates than other graduates, then why? As we mentioned in the opening statements of this report, a sellers' market can be expected to exhibit higher mobility characteristics than other labor exchanges. Thus, one might conclude that the observed out migration rate should simply be expected. Senior IT majors, however, evidence distinct decision criteria favoring a strong wage in selecting their IT job. Illinois does not fare as well in the wage arena as it does in high-tech employment or in the number of high-tech establishments. Illinois ranks between 11th and 15th in high-tech wages, depending on how the wage is calculated. We suspect that the boom in wages and hiring bonuses which have recently characterized the IT field have primarily been in IT companies rather than non-IT companies. Demand in IT companies has been more intense and non-IT companies are more likely to outsource needs and to "grow their own" IT personnel, especially in the tech support area. So, IT graduates who seek to maximize on their starting wage generally can find better offers outside of Illinois.

Senior IT majors also evidence a distinct preference for IT employment fields which are not Illinois' strength in the overall IT industry presence. In the fields of choice indicated by the senior IT majors, Illinois ranks 10th or 11th among the states as measured by employment. The Midwest in general has the lowest incidence of IT companies among the major regions in the

²⁶ The reader also needs to be aware that other fields are experiencing attrition as well. An example is in teaching where estimates are heard exceeding 50% of a new class of teachers either having left teaching as a profession or no longer teaching in Illinois public schools within five years of their baccalaureate degree.

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U.S. If these are the specific fields the students pursue, then a frequent choice to accept a job out of state can be expected, especially if the wage offer is a strong one.

At least three areas of action-oriented responses surface from these observations. For one, there are economic development strategies that could be pursued. An effort to attract more IT firms to the state is an example. The availability of venture capital in Illinois is another area to investigate, especially as it applies to IT. Another consideration is to ask whether our universities are spawning new IT enterprises.

A second action area is for the IBHE to work cooperatively with the Illinois Department of Commerce and Community Affairs to advise the employer community of the wage competition issue. This could lead to materials to promote Illinois to IT majors and in efforts to better advertise the IT programming in higher education in the state to employers in Illinois.

A third action area concerns academic programming. Three possibilities deserve mention. First, hiring personnel responding to the ITAA surveys indicate that a key element in screening applicants and deeming them qualified is the existence of prior job experience, especially related to IT. Nearly a third of the senior IT majors responding to the survey for this study indicated that they held an IT job. However, over 35% reported not being employed at all while nearly 30% held a job, but not in IT. Perhaps academic programs could do more in assisting students in garnering practical, on-the-job IT experience through internships and cooperative ed opportunities. Secondly, there would appear to be some degree of mis-match between the orientation of the IT programs in the state and the IT employment opportunities offered by Illinois businesses and industries. We did not examine this issue closely but flag it as deserving attention. Thirdly, we need to ask whether our academic IT programs are encouraging creativity and development of new applications. These are sources for new start up companies and joint ventures with existing enterprises.

We also observe that about 24% of college bound Illinois high school graduates choose to go out of state for college. As evidenced by the college IT seniors surveyed in this study, out of state students have a higher propensity not to stay in the state where they attend college. The implication here is that when we lose the students between high school and college, we lower the likelihood of getting them back to Illinois for employment.

Furthermore, there appears to be a geographic difference between preference to stay in Illinois for employment versus go elsewhere. Among the IT senior majors surveyed for this study, the non-Chicago area students were more likely to express a preference for jobs out of Illinois than were students originating from the Chicago area. This can be coupled with our observation that the IT senior majors were not well informed about the IT marketplace in terms of which are the opportunity-leading states. This suggests that more could be done to inform students about the marketplace for which they are preparing to enter.

Finally, we remind the reader that the observed higher departure rate among Illinois' IT graduates versus non-IT graduates does not necessarily mean that Illinois is witnessing a "brain drain" in the IT arena. Because Illinois ranks fourth in overall high-tech employment and continues to add to its IT opportunities, especially in non-IT companies, it is likely that Illinois realizes a net gain of IT graduates from other states. This, however, is speculation and remains to be supported by evidence.

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